APPENDIX B
AVIATION DEMAND FORECAST

B.1 INTRODUCTION

B.1.1 Purpose of Forecasts

The forecast of aviation demand for Chicago's O'Hare International Airport (O'Hare) is an input to the assessment of purpose and need, as well as input to technical analyses conducted in connection with the EIS process—including noise modeling, air quality modeling, demand-capacity analysis, and socioeconomic analysis.

B.1.2 Scope and Methodology

For the purposes of the EIS, as described above, detailed derivative forecasts are needed that include: annual demand, peak period demand, and detailed flight schedules.

FAA has determined that it would be most appropriate to use the FAA's Terminal Area Forecast (TAF) as the basis for the detailed derivative forecasts. Each year, FAA prepares a TAF for each towered airport in the United States, based on analysis of historical trends and assumptions regarding the future growth outlook.

The methodology used to develop the detailed derivative forecasts is summarized as follows:

1. The FAA TAF was used as the basis for unconstrained annual demand for O'Hare.
2. Additional data were compiled and analyzed to derive more detailed annual unconstrained forecast information from the FAA TAF.
3. Historical data on peak month demand were used to develop assumptions regarding the future share of peak month activity in relation to forecast annual demand.
4. Peak month activity was divided by the number of days in the peak month to derive forecasts of unconstrained peak month average day (PMAD) activity levels.
5. Detailed unconstrained demand flight schedules were prepared, based on assessments of airline strategic plans and fleet development.
6. Constrained demand flight schedules were prepared, based on the estimated constrained level of demand and the assumed airline response to scheduling activity in a constrained scenario.
7. The constrained demand flight schedules were used to develop a forecast of constrained annual demand, based on the estimated relationship of peak month to annual demand.

The methodology and assumptions described above are presented in more detail in the following sections. The forecast results presented herein are for key years required for the EIS analyses—2007, 2009, 2013, and 2018.

B.2 FORECAST OF UNCONSTRAINED ANNUAL DEMAND

The forecast of unconstrained annual demand for O'Hare represents the future demand levels that could be reasonably expected to result without any significant airport capacity and/or airspace constraints at O'Hare. This section presents background information on the role of O'Hare, historical data on aviation activity at O'Hare, and the forecast of unconstrained future demand.

B.2.1 Background/History

O'Hare is one of the world's busiest airports, serving one of the world's largest aviation markets. As of 2003, according to data published by Airports Council International (ACI), O'Hare ranked 2nd in the world in passengers, 12th in cargo tonnage, and 1st in aircraft operations. O'Hare is a major connecting hub for two of the world's largest airlines—American Airlines and United Airlines—who have developed a vast network of service into and out of O'Hare.

O'Hare is one of several commercial service airports in the greater Chicago area. While other airports contribute to serving the local demand in the greater Chicago area, O'Hare is by far the most significant airport in terms of the level of service provided and the number of passengers served. **Table B-1** presents data on scheduled airline seats and total departing passengers for the airports serving the greater Chicago area.

TABLE B-1
SUMMARY OF REGIONAL PASSENGER AND SERVICE LEVELS FOR THE CHICAGO REGION – CY 2002

Airport	Total Departing Passengers (a)	Percent of Total (c)	Scheduled Departing Seats (b)	Percent of Total (c)
O'Hare	37,570,000	74%	48,846,000	73%
Midway	8,219,000	19%	12,841,000	19%
Milwaukee	2,693,000	6%	4,817,000	7%
Gary	8,000	0%	27,000	0%
Rockford	5,000	0%	0	0%
Total	**94,138,000**	**100%**	**135,385,000**	**100%**

Notes: (a) Airports Council International. Data for Gary and Rockford estimated.
(b) Official Airline Guides.
(c) Values may not add to exactly 100% due to rounding. Values shown as 0% are rounded and indicated 0.5% or less.
Source: Leigh Fisher Associates [TPC]

As shown, O'Hare accommodates much more airline service and passengers than any of the other airports in the region. This is partly attributable to O'Hare's role as a connecting hub, but also related to the high level of airline service necessary to serve local demand.

In terms of local originating passengers (that is, passengers beginning their journey in the greater Chicago area), O'Hare is also the most significant airport in the area, as shown in **Table B-2**. It is estimated that O'Hare accounted for about 66 percent of the regional origin-destination passengers in 2002, based on data published by the U.S. Department of Transportation (DOT).

TABLE B-2
O'HARE SHARE OF REGIONAL ORIGINATING PASSENGERS - 2002

Airport	Originating Passengers	Percent of Total (a)
O'Hare International Airport	15,556,000	66%
Midway International Airport	5,574,000	24%
Milwaukee	2,330,000	10%
Gary	9,000	0%
Rockford	1,000	0%
Total	**23,470,000**	**100%**

Note: (a) Values may not add to exactly 100% due to rounding. Values shown as 0% are rounded and indicated 0.5% or less.
Source: Leigh Fisher Associates [TPC] based on analysis of US DOT data.

While the use of Midway to serve the Chicago region has increased in recent years with the development of low-fare service by a variety of airlines, O'Hare remains the most significant regional airport serving locally generated demand.

Exhibit B-1 shows the historical trend in enplaned passengers at O'Hare from 1980 to 2002, as reported by FAA. The number of passengers increased at an average annual rate of 1.9 percent from 1980 to 2002. This period includes a decline after 2001 due to the events of September 11, 2001, and U.S. economic recession. From 1980 to 2000, the average annual growth rate was 2.5 percent.

Exhibit B-2 shows the historical trend in aircraft operations at O'Hare from 1980 to 2002, as reported by FAA. The number of aircraft operations increased at an average annual rate of 1.1 percent from 1980 to 2002. Excluding the period after 2001, the number of aircraft operations increased at an average annual rate of 1.1 percent from 1980 to 2000.

B.2.2 FAA Terminal Area Forecast

As mentioned earlier, FAA prepares a Terminal Area Forecast (TAF) each year for each towered airport in the United States. The TAF is prepared by FAA staff using industry-standard methodology—including statistical analysis of historical trends, review of recent trends in airline service, and assumptions regarding future airline developments. The FAA TAF represents the official FAA outlook for each airport, and is the standard by which any independently-developed airport forecast is measured.

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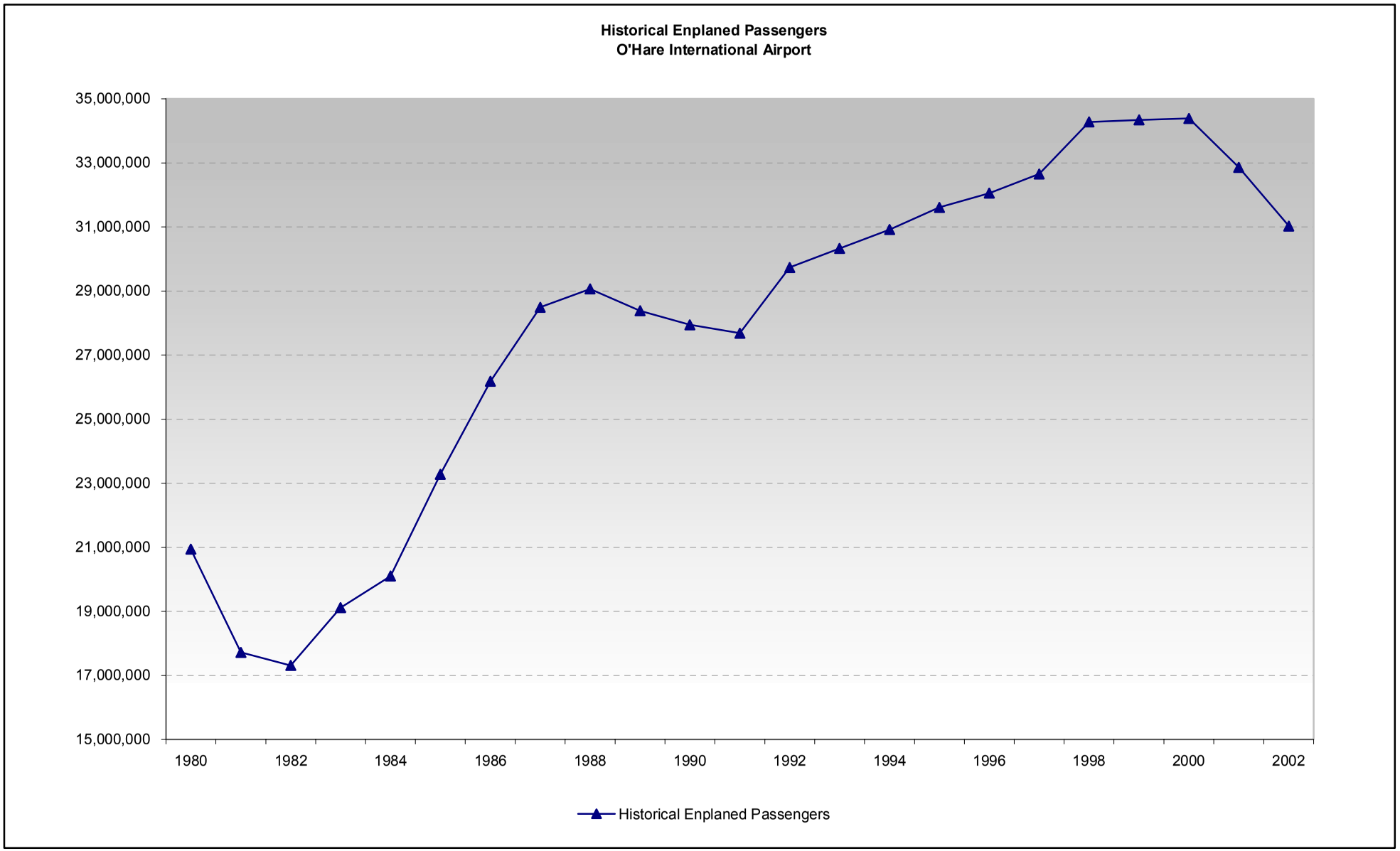

Source: 2002 TAF Federal Aviation Administration.

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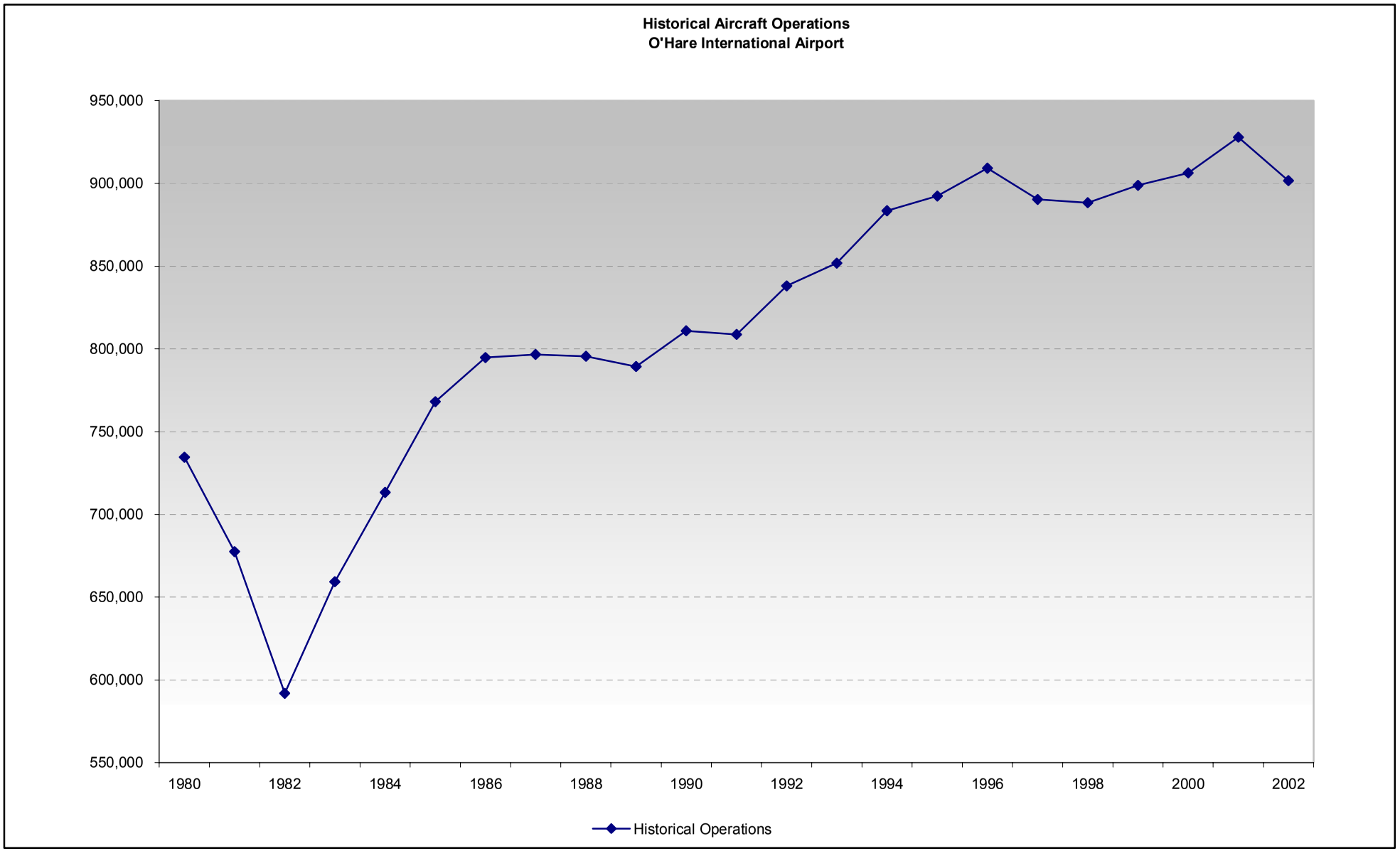

Source: 2002 TAF Federal Aviation Administration.

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At the time that this EIS was initiated, the FAA TAF that was currently available for reference was the 2001 TAF. On December 19, 2002, FAA provided guidance to the City of Chicago in a letter[1] that it was appropriate to use the 2001 TAF as the basis for the more detailed derivative forecasts to be used in this EIS, recognizing that it would be necessary to review any subsequent TAF updates during the EIS process. See **Attachment B-1**.

In early 2003, the FAA issued its 2002 TAF updated from the earlier TAF based on actual airline activity and trends since the end of 2001 (referred to herein as the 2002 TAF), including the effects of recent events such as the terrorist attacks of September 11, 2001. While the overall levels of forecast future demand were not materially different, there were changes in the composition of forecast activity; for example, the 2002 TAF incorporated the recent actions of airlines to transfer service from mainline air carrier operations to regional operations.

Because the 2002 TAF reflected significant changes from the 2001 TAF, and also because the detailed analyses using the forecasts derived from the TAF had not yet been completed, it was determined by FAA that the 2002 TAF should be the basis for developing the detailed derivative forecast information as input to this EIS analyses. This guidance is documented in a letter from FAA to the City of Chicago dated August 21, 2003[2] (included as **Attachment B-2**).

As a result, the 2002 TAF was adopted as the "baseline" demand forecast for this EIS. Subsequently, the detailed derivative forecasts were developed using the 2002 TAF, as described further in this appendix. As stated in the August 21, 2003 letter, "It is anticipated that subsequent forecasts will be issued during the [this] EIS. Should there be significant changes in the forecasts or fleet mix beyond the 2002 TAF, the FAA would expect the EIS to include a sensitivity analysis of the differing forecasts." Since the 2002 TAF, the FAA has issued TAFs for 2003 and 2004. The FAA does not believe the changes since the 2002 TAF are significant. The sensitivity analysis contained in **Appendix R, Alternate Considerations,** demonstrates that the use of any of the recent TAFs (2002, 2003, or 2004) for purposes of this EIS would not be expected to produce significantly different conclusions.

Table B-3 is a summary of the 2002 FAA TAF for O'Hare, for the period from 2002 to 2018. As shown, total enplaned passengers are forecast to increase from 31,026,878 in 2002 to 49,759,252 in 2018, at an average annual rate of 2.9 percent. Also as shown, total aircraft operations are forecast to increase from 901,703 in 2002 to 1,170,635 in 2018, at an average annual rate of 1.5 percent.

[1] Letter from FAA to the City of Chicago, December 19, 2002.
[2] Letter from FAA to the City of Chicago, August 21, 2003.

TABLE B-3
FAA TAF FOR O'HARE – FEDERAL FISCAL YEARS (FY)

	FY 2002	FY 2003	FY 2007	FY 2009	FY 2013	FY 2018	AAGR(a) 2003-2018
Enplaned passengers	31,026,878	32,279,532	36,428,578	38,707,538	43,396,118	49,759,252	2.9%
AAGR	N / A	4.0%	3.1%	3.1%	2.9%	2.8%	N / A
Aircraft Operations	901,703	942,961	1,005,759	1,035,207	1,096,905	1,170,635	1.5%
AAGR	N / A	4.6%	1.6%	1.5%	1.5%	1.3%	N / A

Note: (a) AAGR – Average annual growth rate.
Source: 2002 FAA Terminal Area Forecast, published in March 2003.

The FAA TAF is prepared using data for the Federal Fiscal Year—the 12 months ending September 30. For purposes of the EIS, it was determined that data would be required for calendar years—the year ending December 31—in order to analyze peak month data in relation to the calendar year results. Therefore, the FAA TAF data were converted from federal fiscal years to calendar years. FAA data on calendar year activity were used to develop an estimate of calendar year 2003 enplaned passengers and aircraft operations. The FAA's forecast growth rates for future activity, as contained in the 2002 FAA TAF, were applied to the calendar year 2003 activity in order to develop a calendar year forecast consistent with the fiscal year TAF. The resulting calendar year TAF is presented in **Table B-4.**

TABLE B-4
FAA TAF – CALENDAR YEARS (CY)

Enplaned Passengers	CY 2003	CY 2007	CY 2009	CY 2013	CY 2018
Air Carrier					
Domestic	23,022,000	24,909,000	25,899,000	28,037,000	31,031,000
International	4,580,000	5,878,000	6,547,000	8,020,000	10,161,000
Subtotal	27,602,000	30,787,000	32,446,000	36,057,000	41,192,000
Commuter	5,007,000	6,156,000	6,703,000	7,855,000	9,180,000
Total	**32,609,000**	**36,943,000**	**39,149,000**	**43,912,000**	**50,372,000**
AAGR (a)	n / a	3.2%	2.9%	2.9%	2.8%
Aircraft Operations					
Air Carrier	614,800	646,300	664,700	704,700	761,100
Commuter / air taxi	320,900	353,600	365,300	387,000	401,800
General aviation	24,700	26,200	27,000	28,700	30,900
Military	200	200	200	200	200
Total	**960,500**	**1,026,300**	**1,057,200**	**1,120,600**	**1,194,000**
AAGR (a)	n / a	1.7%	1.5%	1.5%	1.3%

Notes: (a) AAGR – Average annual growth rate.
Source: Leigh Fisher Associates [TPC] based on assumptions stated in text.

The annual number of enplaned passengers and aircraft operations for calendar years are very similar to the fiscal year totals, as shown in the following figures.

Exhibit B-3 shows a comparison of the fiscal year TAF and the calendar year TAF for annual enplaned passengers. The average annual growth rates over the forecast period are identical, and the resulting values are almost identical (calendar year totals are slightly higher because calendar years have 3 months of more recent data than do fiscal years).

Exhibit B-4 shows a comparison of the fiscal year TAF and the calendar year TAF for annual aircraft operations. The average annual growth rates are identical over the forecast period, and the resulting values are almost identical (calendar year totals are slightly higher because calendar years have 3 months of more recent data than do fiscal years). For the remainder of this appendix, all annual data are reported for calendar years.

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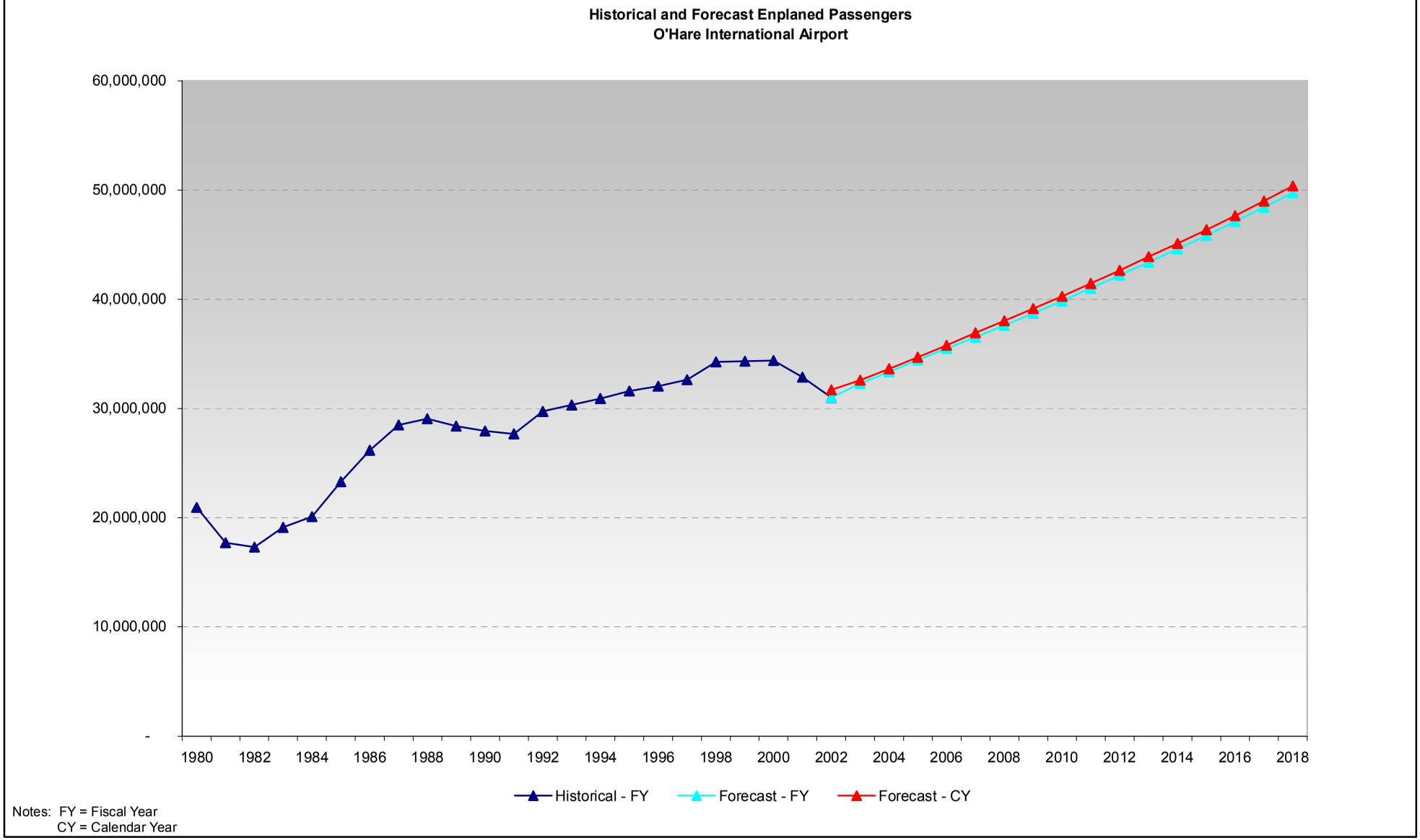

Notes: FY = Fiscal Year
CY = Calendar Year

Source: 2002 TAF Federal Aviation Administration.

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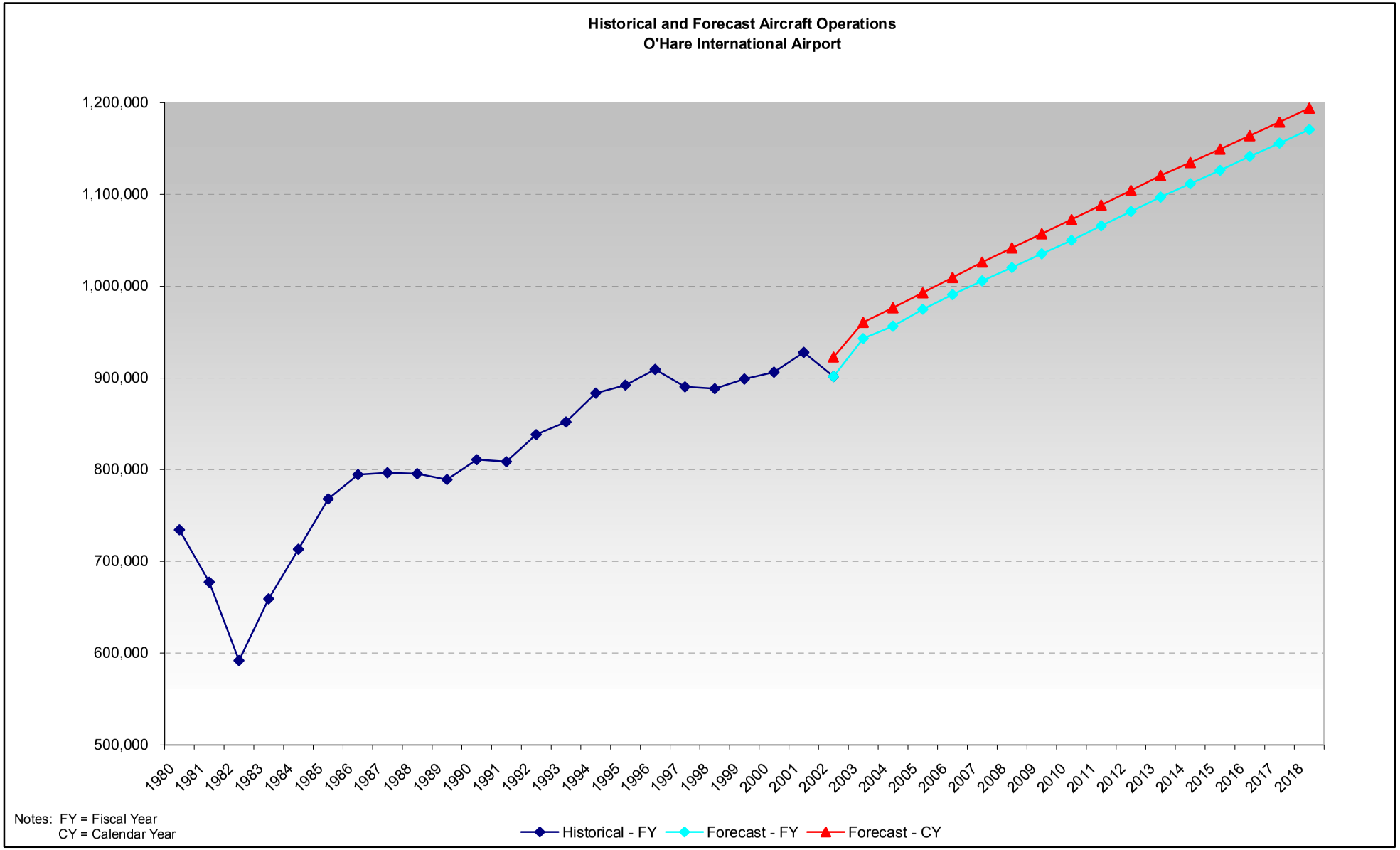

Source: 2002 TAF Federal Aviation Administration.

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B.2.3 Additional Forecast Detail

To develop the detailed peak period forecasts for input to the EIS technical analyses, it was necessary to develop annual forecast data in more detail than is provided by the FAA TAF. For example, the FAA TAF reports air carrier aircraft operations, but does not distinguish between passenger and cargo air carrier aircraft operations. More detailed information on categories of airline activity is compiled and considered in the preparation of the FAA TAF, but the more detailed categories are not included in the published forecast.

For the purpose of developing additional forecast detail, assumptions were developed regarding future airline activity in order to derive more detailed aircraft operations forecast data from the FAA TAF. The primary assumptions used in developing the additional forecast detail relate to the passenger airlines at O'Hare, which represent about 93 percent of the total aircraft operations. **Table B-5** presents assumptions regarding average aircraft size (seats per departure) and boarding loading factor (percent of seats filled by passengers) for the forecast period.

The assumptions regarding passenger airline aircraft utilization reflect the following expectations regarding future airline activity at O'Hare:

1. Air carrier aircraft will increase in size (in terms of average seats per operation) over the forecast period, based on the aircraft on order, fleet renewal plans, and anticipated fleet deployment strategies of airlines serving O'Hare. This is consistent with the FAA's forecast of increased aircraft size for mainline jets for the industry as a whole, as documented in the most recent FAA Aerospace Forecast report.
2. Commuter aircraft will increase in size more significantly than air carrier aircraft, based on the continued introduction of new, larger 70- and 90-seat regional jet aircraft. For consistency with FAA TAF categorization methodologies, all regional jet aircraft assumed to be operated by regional air carriers were included in the "commuter" category, regardless of their seating capacity.
3. Airline yield management and efficiency initiatives will result in increased boarding load factors over the forecast period. Due to the natural fluctuations in demand relative to the need to provide regular scheduled service, it is believed that an overall boarding load factor of 75 percent is a reasonable practical limit.

TABLE B-5
ASSUMED PASSENGER AIRLINE AIRCRAFT UTILIZATION AT O'HARE

Average seats per operation	2003	2007	2009	2013	2018
Air Carrier					
Domestic	128	130	132	134	136
International	168	171	173	177	182
Average	133	137	138	141	145
Commuter	50	54	56	60	65
Overall average	105	108	109	113	118

Boarding Load Factor	2003	2007	2009	2013	2018
Air Carrier					
Domestic	69%	72%	73%	75%	77%
International	73%	74%	74%	75%	77%
Average	70%	72%	73%	75%	77%
Commuter	66%	69%	70%	72%	74%
Overall average	68%	71%	72%	73%	75%

Source: Leigh Fisher Associates [TPC].

Based upon these utilization factors, the average annual growth in the number of passengers per operation is 1.4 percent over the forecast period. This results in a net increase of 17 passengers per operation over the forecast period, consistent with results contained in the FAA TAF. Using the assumptions from **Table B-5**, the resulting more detailed forecast of aircraft operations is presented in **Table B-6**.

TABLE B-6
ADDITIONAL FORECAST DETAIL – UNCONSTRAINED ANNUAL DEMAND

Aircraft Operations	2003	2007	2009	2013	2018
Air Carrier					
Passenger airlines					
Domestic	519,600	531,200	540,400	561,200	591,800
International	74,400	93,400	102,200	120,600	145,200
Subtotal	**594,000**	**624,600**	**642,600**	**681,800**	**737,000**
Cargo airlines	20,800	21,700	22,100	22,900	24,100
Subtotal	**614,800**	**646,300**	**664,700**	**704,700**	**761,100**
Commuter/air taxi					
Passenger airlines	303,400	332,800	343,800	365,400	382,600
Other	17,400	20,800	21,500	21,600	19,200
Subtotal	**320,800**	**353,600**	**365,300**	**387,000**	**401,800**
General Aviation	24,700	26,200	27,000	28,700	30,900
Military	200	200	200	200	200
Total	**960,500**	**1,026,300**	**1,057,200**	**1,120,600**	**1,194,000**

Source: Leigh Fisher Associates [TPC] analysis based on assumptions described in text.

B.3 FORECAST OF UNCONSTRAINED PEAK PERIOD DEMAND

Peak period demand is the basis for inputs to EIS modeling such as noise and demand/capacity. The forecast of unconstrained peak period demand includes: peak month activity, peak month average day activity, and peak month average day flight schedules. Peak period demand was derived from the unconstrained annual demand using the methodology and assumptions described below.

B.3.1 Peak Month

The forecast of peak month activity was derived from the forecast of annual activity using assumptions regarding peak month "factors"—the peak month as a percentage of the annual total.

Historical monthly data for the past 10 years were reviewed to evaluate the trend in peak month activity (passengers and aircraft operations) as a percentage of the annual total. On the basis of this review, assumptions were developed regarding future peak month activity as a percentage of annual demand, and applied to the annual demand forecasts presented earlier. It was assumed that overall peak month percentages would not change materially over the forecast period, as there is no reason to expect that the seasonal pattern of air traffic activity will change significantly in a mature aviation market such as O'Hare's.

Table B-7 presents the forecast of peak month enplaned passengers and aircraft operations. As shown, the peak month factor for total enplaned passengers is estimated to be about 9.8 percent during the forecast period, and the peak month factor for total aircraft operations is estimated to be about 8.9 percent during the forecast period. The peak month factor for enplaned passengers is higher than the peak month factor for aircraft operations because in the peak month there are typically larger aircraft and higher boarding load factors.

The average month of the year is 8.3 percent of the year. The peak month factors identified above are greater than 8.3 percent, which is consistent with a peak month having above-average activity.

TABLE B-7
UNCONSTRAINED FORECAST OF PEAK MONTH DEMAND

Enplaned passengers	**2003**	**2007**	**2009**	**2013**	**2018**
Air Carrier					
Domestic	2,233,134	2,416,173	2,512,203	2,719,589	3,010,007
International	476,320	611,312	680,888	834,080	1,056,744
Subtotal	**2,709,454**	**3,027,485**	**3,193,091**	**3,553,669**	**4,066,751**
Commuter	485,679	597,132	650,191	761,935	890,460
Total	**3,195,133**	**3,624,617**	**3,843,282**	**4,315,604**	**4,957,211**
Peak month factor (a)	9.8%	9.8%	9.8%	9.8%	9.8%
Aircraft operations					
Air Carrier					
Domestic	45,725	47,117	47,933	49,778	52,493
International	6,770	8,499	9,300	10,975	13,213
Cargo	1,872	1,823	1,856	1,924	1,988
Subtotal	**54,367**	**57,440**	**59,090**	**62,677**	**67,694**
Commuter / air taxi					
Commuter	26,699	29,286	30,254	32,155	33,669
Air taxi	1,566	1,872	1,935	1,944	1,728
Subtotal	**28,265**	**31,158**	**32,189**	**34,099**	**35,397**
General aviation	2,396	2,306	2,376	2,526	2,719
Military	22	22	22	22	22
Total	**85,050**	**90,926**	**93,677**	**99,323**	**105,832**
Peak month factor (a)	8.9%	8.9%	8.9%	8.9%	8.9%

Note: (a) Peak month factor = peak month as a percent of annual demand.
Source: Leigh Fisher Associates [TPC].

B.3.2 Peak Month Average Day

The peak month average day (PMAD) is the mathematical average of the peak month activity. The PMAD level of activity serves as the "control total" for the PMAD flight schedules used as input to detailed technical analyses such as noise modeling and demand-capacity modeling. **Table B-8** presents the unconstrained forecast of PMAD aircraft operations, which represents the peak month number of operations divided by 31 days in the peak month.

TABLE B-8
UNCONSTRAINED PEAK MONTH AVERAGE DAY AIRCRAFT OPERATIONS

	2003	2007	2009	2013	2018
Air Carrier					
Domestic	1,475	1,520	1,546	1,606	1,693
International	218	274	300	354	426
Cargo	60	59	60	62	64
Subtotal	**1,754**	**1,853**	**1,906**	**2,022**	**2,184**
Commuter/air taxi					
Commuter	861	945	976	1,037	1,086
Air taxi	51	60	62	63	56
Subtotal	**912**	**1,005**	**1,038**	**1,100**	**1,142**
General Aviation					
Unadjusted	77	74	77	81	88
Helicopter adjustment	0	(32)	(33)	(35)	(38)
Adjusted	77	42	44	46	50
Military	1	1	1	1	1
Total	**2,744**	**2,901**	**2,989**	**3,169**	**3,376**

Note: "( )" indicates a negative value.
Source: Leigh Fisher Associates [TPC]

Table B-8 also shows an adjustment to the general aviation aircraft operations used to determine PMAD activity levels. The general aviation aircraft operations reported by FAA at O'Hare include a certain number of helicopter operations, primarily associated with local traffic (e.g. police and news reporting) functions that do not use the O'Hare airfield and therefore do not contribute to airfield demand. For purposes of developing the detailed aircraft operations flight schedules for input to the EIS technical analyses, it was determined that these helicopter flights should not be included. Therefore, an adjustment was made to remove these helicopter operations for the future forecast years (2007, 2009, 2013, and 2018) as shown in **Table B-8**. The adjustment was based on an analysis of data on actual helicopter operations in 2002 and 2003.

B.4 FORECAST OF UNCONSTRAINED PMAD FLIGHT SCHEDULES

For input to simulation analyses such as airfield demand-capacity analysis required in connection with the EIS, a detailed flight schedule of aircraft operations is required. This detailed flight schedule includes individual arriving and departing flights, with information on airline, origin/destination, equipment type, and arrival/departure time. Passenger-related data in the flight schedule includes passengers per operation (based on an assumed boarding load factor) and the split of origin-destination and connecting passengers.

The forecast PMAD operations levels reported above served as the "control totals" for the number of aircraft operations to be included in the detailed flight schedules for each forecast year. Using these control totals, additional assumptions were developed to produce the flight schedules, as described below.

B.4.1 Key Assumptions

Airline flight schedule data for O'Hare were obtained from BACK Aviation Solutions for the peak month (August) of 2003 to evaluate airline scheduling practices and the distribution of PMAD aircraft operations by airline, equipment type, origin/destination, and time of day. Additional data were reviewed for non-airline activity (e.g., air taxi and general aviation).

The key inputs and assumptions used in developing the unconstrained PMAD flight schedules are summarized as follows:

- Control Totals—Each category of activity of activity was forecast to increase in accordance with the PMAD operations levels reported in **Table B-8**.
- Aircraft Fleet—Airline aircraft fleet orders were reviewed to determine the anticipated evolution of the fleet to newer-generation aircraft.
- Market Growth—Overall market growth implied by the FAA TAF was applied to individual markets in order to determine likely increases in service frequency and up-gauging of aircraft size on specific routes.
- Time-of-Day Profile—It was assumed that there would be no significant change in the overall time-of-day profile of flight scheduling in relation to the data compiled for 2003.

B.4.2 Results

The results of the unconstrained demand PMAD flight schedules are summarized in a series of tables presented below.

Table B-9 presents a summary of aircraft operations and passengers, for each of the main categories of activity.

TABLE B-9
SUMMARY OF UNCONSTRAINED PMAD FLIGHT SCHEDULES

Daily Aircraft Operations	**2007**	**2009**	**2013**	**2018**
Air Carrier				
Domestic	1,521	1,547	1,607	1,695
International	274	300	354	426
Cargo	58	60	62	62
Subtotal	**1,853**	**1,907**	**2,023**	**2,183**
Commuter	944	976	1,038	1,086
Subtotal	**2,797**	**2,883**	**3,061**	**3,269**
Other				
Air Taxi	60	62	62	56
General Aviation	41	42	46	49
Military	0	0	0	0
Total	**2,898**	**2,987**	**3,169**	**3,374**
PMAD as Percentage of Annual	0.282%	0.283%	0.283%	0.283%
Daily Passengers	**2007**	**2009**	**2013**	**2018**
Air Carrier				
Domestic				
Origin-Destination	75,449	79,453	88,512	103,218
Connecting	80,429	82,696	86,942	90,972
Total	**155,878**	**162,149**	**175,454**	**194,190**
International				
Origin-Destination	25,749	28,387	35,790	47,743
Connecting	13,547	15,388	17,842	21,217
Total	**39,296**	**43,775**	**53,632**	**67,960**
Percentage of Air Carrier	20.1%	21.3%	23.4%	25.9%
Air Carrier Total				
Origin-Destination	101,197	107,840	124,303	149,960
Connecting	93,977	98,083	104,783	112,190
Total	**195,174**	**205,924**	**229,086**	**262,150**
Commuter				
Origin-Destination	15,498	16,787	19,544	22,896
Connecting	23,019	25,157	29,616	34,579
Total	**38,517**	**41,944**	**49,160**	**57,474**
Total: Air Carrier and Commuter				
Origin-Destination	116,696	124,628	143,846	172,856
Connecting	116,996	123,240	134,399	146,769
Total	**233,691**	**247,868**	**278,245**	**319,625**
Percentage O-D	49.9%	50.3%	51.7%	54.1%
Percentage Connecting	50.1%	49.7%	48.3%	45.9%
PMAD Percentage of Annual	0.316%	0.317%	0.317%	0.317%

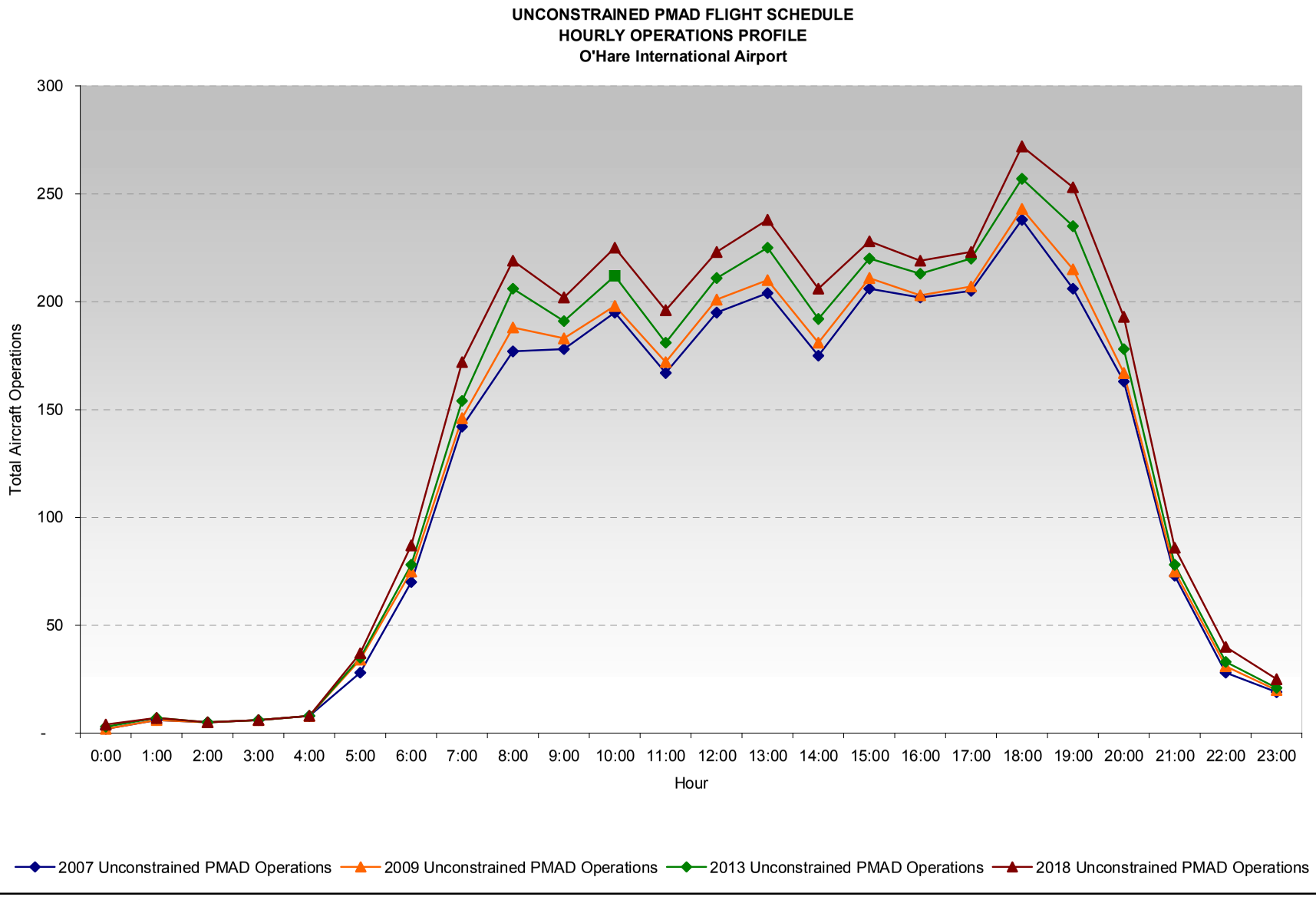
Source: Leigh Fisher Associates [TPC]

The number of aircraft operations in **Table B-9** is generally consistent with the control total number of aircraft operations presented in **Table B-8**. The number of passengers is based on the assumed average aircraft size and boarding load factor for individual flights. The overall trend in average aircraft size and load factor is consistent with the annual demand forecast.

Exhibit B-5 shows the profile of total aircraft operations by hour for each of the unconstrained PMAD flight schedules.

As shown, the overall profile of operations by hour is expected to remain generally the same over the forecast period. The peak periods of aircraft operations are primarily determined by the scheduling of passenger airline aircraft operations (which represent about 95 percent of the total number of PMAD aircraft operations) and are substantially determined by passenger preferences for flight times. It is not believed that the most popular hours of passenger travel will change materially over the forecast period.

Table B-10 is a summary of the aircraft fleet mix represented by the forecast unconstrained PMAD flight schedules.



Source: Leigh Fisher Associates (TPC), 2004

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TABLE B-10
UNCONSTRAINED PMAD SCHEDULE FLEET MIX SUMMARY

	2007	2009	2013	2018
Air Carrier				
Domestic				
Narrowbody Passenger				
A319/320/321	510	693	847	861
717	0	0	16	30
B737-200/300/400/500	192	126	0	0
B737-700/800/900	131	201	664	746
B757-200	109	4	0	0
F100	0	0	0	0
DC-9-30/50	38	0	0	0
MD80/90	491	465	22	0
Widebody Passenger				
B767-300	28	32	32	6
B777-200	16	20	20	46
B747-400	6	6	6	6
Narrowbody Freighter				
B727F	4	4	0	0
B757F	0	2	4	4
DC-8F	8	8	0	0
Widebody Freighter				
A300/310F	12	12	18	18
B767F	2	2	8	8
B747F	0	0	0	0
MD10/11F	6	6	6	6
International				
Narrowbody Passenger				
A319/320/321	83	86	108	120
B737-200/300/400/500	2	2	0	0
B737-700/800/900	14	24	72	92
B757-200	9	6	0	0
F100	0	0	0	0
MD80/87	40	40	0	0
Widebody Passenger				
A330-200/300	9	10	12	12
A340-200/300/600	16	18	26	32
A380	0	2	4	10
B747-400	14	12	14	17
B767-300	36	44	58	68
B777-200/300	39	44	48	55
Widebody Freighter				
A380F	0	0	0	0
B747F	23	23	23	23
MD11F	3	3	3	1

TABLE B-10
UNCONSTRAINED PMAD SCHEDULE FLEET MIX SUMMARY

Commuter/Air Taxi					
Domestic					
	Scheduled				
		BAE146	0	0	0	0
		E140/145	346	294	281	253
		CRJ200	353	307	237	179
		CRJ700	227	327	406	406
		CRJ900	18	48	114	248
	Air Taxi					
		Turboprop	6	6	6	0
		Jet	54	56	56	56
International						
	Scheduled					
		E140/145	0	0	0	0
		CRJ200	12	12	12	20
General Aviation						
	Prop		6	6	6	6
	Jet		35	36	40	43
Total			**2,898**	**2,987**	**3,169**	**3,374**

Source: Leigh Fisher Associates [TPC].

B.5 FORECAST OF CONSTRAINED DEMAND

A forecast of constrained demand was prepared to evaluate the differences in annual and peak period activity that would be estimated to result in the event that there were no capacity improvements implemented at O'Hare. FAA tasked TPC with preparing the forecast of constrained demand.

The methodology used in developing the forecast of constrained demand is summarized as follows:

1. Level of Constraint—The results of demand-capacity analysis were used to determine when the unconstrained demand levels would be constrained by the existing O'Hare capacity.
2. Constrained PMAD Flight Schedules—Based on the estimated constrained demand levels, representative constrained peak month average day (PMAD) flight schedules were prepared to reflect likely airline actions to rationalize air service.
3. Constrained Annual Demand—The activity levels represented by the constrained PMAD flight schedules were translated into annual demand levels based on the typical relationships between peak period and annual demand levels.

B.5.1 Constrained PMAD Flight Schedules

The key factors considered, assumptions used, and results of the development of constrained PMAD flight schedules are described below.

B.5.1.1 Determination of Constrained Demand Level

Aircraft delays associated with airfield capacity constraints generally increase exponentially as demand approaches or exceeds capacity. Theoretically, delays can increase to unrealistically high levels as demand exceeds capacity during a greater number of hours in the day. In reality, however, airlines and the traveling public change their behavior in reaction to increasing delays and the costs associated with them (e.g., increased fuel consumption, lost aircraft and crew utilization, increased travel time).

In reaction to high delays, the airlines may decide to schedule flights during periods of lower activity when delays are less likely to occur or serve an airport with larger aircraft, enabling them to carry greater numbers of passengers without increasing the number of flights they fly. Passengers may also decide to fly during off-peak times when they are less likely to be delayed. They may also decide to use an alternative airport, use a different mode of transportation (e.g., driving), or forgo their trip entirely.

Regardless of the exact nature of the reaction, it has generally been assumed that increasing delay levels at an airport will slow growth in aviation operations at an airport and at extremely high delay levels may preclude growth in activity entirely.

A thorough evaluation of analytical data that examines the relationship between aircraft delay and airport capacity indicates that market forces will likely constrain aircraft operations at O'Hare when average annual delay reaches approximately 15 minutes per operation. Selection of this level of delay as the metric to "cap" aircraft operations in a constrained (i.e., no action) environment is consistent with the FAA's Benefit-Cost Analysis guidance, historical data collected from O'Hare and other highly-delayed U.S. airports, and precedents set in other recent EIS efforts' supporting capacity-enhancing projects at representative large airports.

The FAA initially developed constrained forecasts based on delay results of TAAM experiments conducted as part of the O'Hare Master Plan. Specifically, it was assumed based on this prior work that (1) the No Action (Alternative A) airfield could accommodate the forecast of unconstrained demand in future years 2007 and 2009 at levels of delay not exceeding an average of about 15 minutes per operation, and (2) forecast aircraft activity would need to be constrained in the future years 2013 and 2018 in order to avoid delays significantly higher than this level. The FAA's TPC prepared forecast flight schedules and provided them to the City of Chicago for use in the EIS TAAM analysis.

As the FAA reviewed preliminary results of the TAAM analysis of the 2007 and 2009 No Action alternative provided by the City of Chicago, it was determined that average annual delays were above 20 minutes per operation, using the unconstrained forecast for these years. Thus, it was determined that, for Alternative A, aircraft activity would need to be constrained in 2007 and 2009 (in addition to 2013 and 2018), in order to produce reasonable levels of average delay. As a

result, the FAA stopped the No Action alternative evaluation and re-constrained the forecast of aircraft activity. This further constraint resulted in an operational limitation of approximately 2,750 operations per day, or approximately 974,000 annual operations, for all forecast years of evaluation. Constrained PMAD flight schedules were prepared for each of the forecast years (2007, 2009, 2013, and 2018) with daily aircraft operations "capped" at a level of 2,750, and used as input to updated TAAM analysis for Alternative A. FAA closely monitored the delay results of the subsequent TAAM analyses provided by the City of Chicago. Results from this revised analysis resulted in average annual delays in the range of 16 to 17 minutes per operation, or approximately at the same levels of delays experienced today.

In establishing this "capped" level of PMAD operations, consideration was given to the potential for airlines to utilize off-peak hours and therefore increase the number of daily operations. The operations at O'Hare are currently well spread over the hours of the day, and it was determined that were would be no significant opportunity to increase constrained PMAD operations by spreading flights.

B.5.1.2 Factors Affecting Airline Scheduling

Key factors impacting airline scheduling decisions in a constrained operating environment would likely include the following:

- O-D vs. connecting: In a constrained operating environment, it is assumed that the dominant hubbing air carriers at O'Hare would prioritize the accommodation of origination/destination (O-D) passenger traffic over connecting passenger traffic. O-D passenger traffic generally commands higher average fare revenue, and airlines have alternatives for routing connecting passenger traffic through other hubs.
- Aircraft equipment deployment: In conjunction with a constrained operating environment and a focus on accommodating O-D passenger traffic, it is assumed that the dominant hubbing air carriers would begin to adjust aircraft equipment deployment in the following manner:
    a. Up-gauge aircraft to absorb additional traffic, as opposed to adding additional frequencies, in popular O-D and longer-haul markets.
    b. Consolidate small-capacity regional/commuter aircraft in strong O-D markets into a smaller number of higher-capacity mainline jet flights.
    c. Reduce the number of flights operated by regional partners in connecting markets with limited O-D traffic generation potential.

B.5.1.3 Key Assumptions

The key inputs and assumptions used in developing the constrained PMAD flight schedules are summarized as follows:

- Control Totals: Adjustments were made to the unconstrained PMAD schedules to represent actions that would likely be taken by the passenger air carriers serving O'Hare

if operations were constrained to no more than 2,750 per day. Due to the relatively small number of non-passenger flights (i.e., cargo and general aviation), coupled with the ability to accommodate most cargo movements during off-peak hours, non-passenger related activity remains unchanged from the unconstrained scenarios.

- Derivative O-D and Connecting Passenger Activity: For the main hubbing airlines—American Airlines and United Airlines (and associated regional connecting partners)--it was assumed that the O-D percentage would increase in the constrained forecast scenario. Somewhat offsetting this assumption, it was also assumed that activity attributable to new-entrant carriers contained in the unconstrained forecast would not be present in a constrained scenario. That is, in an airfield and gate constrained environment, it is less likely that new entrants would choose to (or be able to) initiate service at O'Hare. Because these new entrants serve primarily O-D passengers (in contrast to the incumbent hubbing carriers), this has the effect of reducing the overall O-D percentage. The combined effect of these assumptions is that there would be no material change in the overall O-D percentage at O'Hare in the constrained forecast relative to the unconstrained forecast.
- Aircraft Fleet and Market Growth: In the constrained forecast scenario, the reduction in aircraft activity will result in the overall up-gauging of the aircraft fleet and consolidation of smaller capacity commuter/regional flights in favor of higher capacity mainline jet flights. This assumption was implemented through the following schedule adjustments:

    a. Mainline jet flights were up-gauged to larger aircraft in key domestic and international O-D markets.

    b. In several stronger O-D markets, regional/commuter flights were consolidated into a smaller number of mainline jet flights.

    c. Commuter/regional flight frequencies were reduced in lower-performing O-D and connecting markets. In order to preserve some eliminated capacity, at least one remaining flight in each reduced-frequency market was up-gauged to a larger aircraft (i.e., 50-seat CRJ200 to 70-seat CRJ700). No markets currently served from O'Hare were assumed to lose all service as a result of this adjustment.

    d. Time of day profile: It is not believed that the most popular hours of passenger travel would change materially over the forecast period, even in a constrained operating environment. As stated above, it was determined that there would not be significant opportunity to increase PMAD flight operations by changing the time of day profile of scheduled flights. Thus, the hourly distribution of flights, seats, and passengers is held reasonably consistent with the unconstrained PMAD forecast flight schedules.

TABLE B-11
SUMMARY OF CONSTRAINED PMAD FLIGHT SCHEDULES

Daily Aircraft Operations	**2007**	**2009**	**2013**	**2018**
Air Carrier				
Domestic	1,476	1,474	1,492	1,495
International	270	294	339	380
Cargo	58	60	62	62
Total	**1,804**	**1,828**	**1,893**	**1,937**
Commuter	845	818	749	708
Total	**2,649**	**2,646**	**2,642**	**2,645**
Other				
Air Taxi	60	62	62	56
General Aviation	41	42	46	49
Military	0	0	0	0
Total	**2,750**	**2,750**	**2,750**	**2,750**
PMAD as Percentage of Annual	0.28%	0.28%	0.28%	0.28%
Daily Passengers				
Air Carrier				
Domestic				
Origin-Destination	75,934	79,028	86,237	98,972
Connecting	78,020	79,157	83,706	85,834
Total	**153,954**	**158,185**	**169,943**	**184,806**
Percentage of Air Carrier	79.8%	78.5%	76.6%	75.3%
International				
Origin-Destination	25,857	28,503	35,122	41,652
Connecting	13,187	14,851	16,905	18,807
Total	**39,044**	**43,354**	**52,027**	**60,459**
Percentage of Air Carrier	20.2%	21.5%	23.4%	24.7%
Air Carrier Total				
Origin-Destination	101,791	107,531	121,359	140,624
Connecting	91,207	94,008	100,611	104,641
Total	**192,998**	**201,539**	**221,970**	**245,265**
Commuter				
Origin-Destination	14,630	15,073	14,901	16,583
Connecting	21,486	22,191	22,344	23,515
Total	**36,116**	**37,264**	**37,245**	**40,098**
Total: Air Carrier and Commuter				
Origin-Destination	116,421	122,604	136,260	157,207
Connecting	112,693	116,199	122,955	128,156
Total	**229,114**	**238,803**	**259,215**	**285,363**
Percentage O-D	50.8%	51.3%	52.6%	55.1%
Percentage Connecting	49.2%	48.7%	47.4%	44.9%
PMAD Percentage of Annual	0.32%	0.32%	0.32%	0.32%

Source: Leigh Fisher Associates [TPC].

B.5.1.4 Results

The results of the constrained demand PMAD flight schedules are summarized in a series of tables presented below.

Table B-11 presents a summary of aircraft operations and passengers, for each of the main categories of activity. **Exhibit B-6** shows the profile of aircraft operations by hour for each of the constrained PMAD flight schedules. **Table B-12** is a summary of the aircraft fleet mix represented by the forecast constrained PMAD flight schedules.

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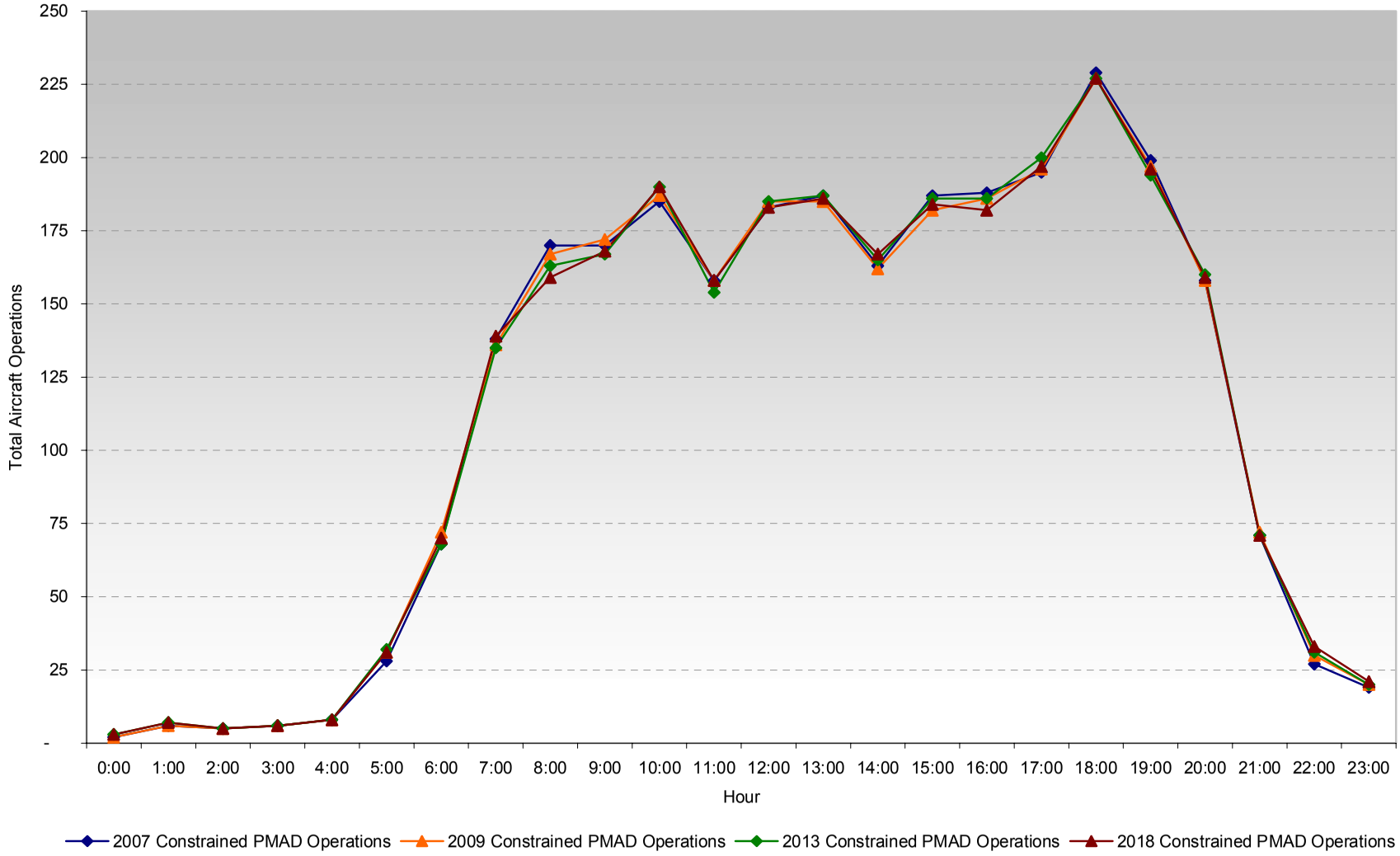

Source: Leigh Fisher Associates (TPC), 2004

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TABLE B-12
CONSTRAINED PMAD SCHEDULE FLEET MIX SUMMARY

	2007	2009	2013	2018
Air Carrier				
Domestic				
Narrowbody Passenger				
A319/320/321	522	687	794	780
717	0	0	0	0
B737-200/300/400/500	164	102	0	0
B737-700/800/900	211	268	633	634
B757-200	109	0	0	0
F100	0	0	0	0
DC-9-30/50	30	0	0	0
MD80/90	390	366	14	0
Widebody Passenger				
B767-300	28	30	30	28
B777-200	16	15	15	44
B747-400	6	6	6	9
Narrowbody Freighter				
B727F	4	4	0	0
B757F	0	2	4	4
DC-8F	8	8	0	0
Widebody Freighter				
A300/310F	12	12	18	18
B767F	2	2	8	8
B747F	0	0	0	0
MD10/11F	6	6	6	6
International				
Narrowbody Passenger				
A319/320/321	81	84	102	110
B737-200/300/400/500	2	1	0	0
B737-700/800/900	20	30	68	79
B757-200	9	6	0	0
F100	0	0	0	0
MD80/87	32	32	0	0
Widebody Passenger				
A330-200/300	9	10	12	12
A340-200/300/600	16	18	22	20
A380	0	2	4	8
B747-400	14	12	14	17
B767-300	36	43	57	63
B777-200/300	39	44	48	51
Widebody Freighter				
A380F	0	0	0	2
B747F	23	23	23	23
MD11F	3	3	3	1

TABLE B-12
CONSTRAINED PMAD SCHEDULE FLEET MIX SUMMARY

	2007	2009	2013	2018
Commuter/Air Taxi				
Domestic				
Scheduled				
BAE146	0	0	0	0
E140/145	258	187	150	110
CRJ200	274	202	134	80
CRJ700	292	368	358	285
CRJ900	21	61	107	233
Air Taxi				
Turboprop	6	6	6	0
Jet	54	56	56	56
International				
Scheduled				
E140/145	0	0	0	0
CRJ200	12	12	12	20
General Aviation				
Prop	6	6	6	6
Jet	35	36	40	43
Total	**2,750**	**2,750**	**2,750**	**2,750**

Source: Leigh Fisher Associates [TPC].

B.6 CONSTRAINED ANNUAL DEMAND

Based upon typical relationships established between peak period and annual demand levels, the constrained PMAD flight schedule activity levels were translated into the annual demand levels depicted in **Table B-13**.

TABLE B-13
CONSTRAINED FORECAST ANNUAL DEMAND

Annual Enplaned Passengers	**2007**	**2009**	**2013**	**2018**
Air Carrier				
Domestic	24,607,000	25,278,500	27,177,500	29,528,500
International	5,840,500	6,484,000	7,780,000	9,039,500
Subtotal	30,447,500	31,762,500	34,597,500	38,568,000
Commuter	5,772,000	5,955,000	5,951,000	6,404,500
Total	**36,219,500**	**37,717,500**	**40,908,500**	**44,972,500**
Annual Aircraft Operations				
Air Carrier				
Passenger Airlines				
Domestic	515,200	514,900	521,400	520,700
International	92,000	100,200	115,500	129,500
Subtotal	**607,200**	**615,100**	**636,900**	**650,200**
Cargo Airlines	21,700	22,100	22,900	24,100
Subtotal	**628,900**	**637,200**	**659,800**	**674,300**
Commuter / Air Taxi				
Passenger Airlines	297,900	288,100	263,700	249,400
Other / Air Taxi	20,800	21,500	21,600	19,200
Subtotal	**318,700**	**309,600**	**285,300**	**268,600**
General Aviation	26,200	27,000	28,700	30,900
Military	200	200	200	200
Total	**974,000**	**974,000**	**974,000**	**974,000**

Source: Leigh Fisher Associates [TPC].

When compared to the unconstrained demand forecast, this constrained forecast analysis indicates that the lack of capacity improvements could result in approximately 5,400,000 enplaned passengers not being accommodated at O'Hare by 2018. This level of traffic is approximately equal to about half of the annual enplanements served at Midway in 2004 or about the same as the number of annual enplanements served at Memphis, TN in 2004. In **Chapter 3, Alternatives** of this EIS, the FAA identifies and examines an array of alternatives that might address some or all of this anticipated unmet demand. As is estimated to be the

case at other constrained airports, it is believed by FAA that, in a constrained scenario for O'Hare, there would likely be a certain amount of demand that would not be accommodated at all—that is, there would be a reduction in overall travel activity due to the inability of airlines to offer service in the amounts corresponding to unconstrained demand. In addition, it is likely that a shortfall of capacity in relation to demand would result in higher average airfares than would be the case in an unconstrained demand scenario.

B.7 SUMMARY

Table B-14 presents a summary of the key forecast information presented in this appendix—annual enplaned passengers, annual aircraft operations, and PMAD aircraft operations—for the unconstrained and constrained scenarios.

TABLE B-14
FORECAST SUMMARY

	Unconstrained				Constrained			
	2007	**2009**	**2013**	**2018**	**2007**	**2009**	**2013**	**2018**
Annual enplaned Passengers total	36,943,000	39,149,000	43,912,000	50,372,000	36,219,500	37,717,500	40,908,500	44,972,500
Annual aircraft operations total	1,026,300	1,057,000	1,120,600	1,194,000	974,000	974,000	974,000	974,000
Peak month, average day aircraft operations total	2,898	2,987	3,169	3,374	2,750	2,750	2,750	2,750

Source: Leigh Fisher Associates [TPC]

ATTACHMENT B-1

12/19/2002 LETTER REGARDING USE OF FAA 2001 TAF

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U. S. Department
Of Transportation
Federal Aviation Administration

Great Lakes Region
Illinois, Indiana, Michigan
Minnesota, North Dakota,
Ohio, South Dakota,
Wisconsin

2300 East Devon Avenue
Des Plaines, Illinois 60018

December 19, 2002

Mr. Christopher P. Arman
Deputy Commissioner, Department of Aviation
O'Hare Modernization Program Office
8755 W. Higgins Road, Suite 610
Chicago, IL 60631

Subject: Use of FAA's 2001 Terminal Area Forecast for Planning Purposes
And Acceptance of Derivative Forecast Methodology

Dear Mr. Arman:

This letter is in response to your requests to use the Federal Aviation Administration's (FAA's) 2001 Terminal Area Forecast (TAF) for planning purposes in support of the O'Hare Modernization Program (OMP) Environmental Impact Statement (EIS), and for concurrence on the methodology used to prepare subsequent derivative demand profiles.

The FAA concurs with your request to utilize the FAA's 2001 TAF for planning purposes. At this time, the 2001 TAF is the most current TAF published. It is anticipated that subsequent FAA forecasts will be issued during the OMP EIS process. Accordingly, appropriate consideration/discussion of any differences with, and the consequences of, subsequent forecasts may prove necessary in the forthcoming OMP EIS. In such a case we would expect the EIS to include a sensitivity analysis of the differing forecasts. An analysis of the effect of potential fleet changes may also be necessary as it appears likely that, at least in the short-term, there may be considerable migration from main line aircraft to regional jets.

After consultation with FAA's Systems Analysis and Policy Analysis Division, we also concur that the methodology used by the City in the preparation of derivative demand profiles through 2022 is appropriate and sound. We appreciate your efforts to ensure that the methodology and assumptions utilized have been extensively coordinated with and reviewed by FAA staff.

We appreciate your ongoing commitment to coordination efforts with us on this EIS. Since changes are likely to occur in a project of this magnitude, we solicit your continued cooperation with FAA to ensure that additional concerns or questions posed by us, especially with regard to aviation forecasts, are addressed to our satisfaction.

Sincerely,

Philip M. Smithmeyer, Manager
Chicago Airports District Office

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ATTACHMENT B-2

8/21/2003 LETTER REGARDING USE OF FAA 2002 TAF

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U.S. Department
of Transportation
Federal Aviation Administration

Great Lakes Region
Illinois, Indiana, Michigan,
Minnesota, North Dakota,
Ohio, South Dakota,
Wisconsin

2300 East Devon Avenue
Des Plaines, Illinois 60018

August 21, 2003

Mr. Christopher P. Arman
Deputy Commissioner, Department of Aviation
O'Hare Modernization Program Office
8755 W. Higgins Road, Suite 610
Chicago, IL 60631

Subject: Use of FAA's 2002 Terminal Area Forecast for Planning Purposes And Reaffirmation of Derivative Forecast Methodology

Dear Mr. Arman:

This letter is to confirm our August 7, 2003 discussion on the use of the Federal Aviation Administration's (FAA's) 2002 Terminal Area Forecast (TAF) for planning purposes in support of the O'Hare Modernization Program (OMP) Environmental Impact Statement (EIS). The FAA has subsequently determined that it is appropriate to use the 2002 TAF for the OMP EIS.

The FAA had agreed on December 19, 2002, to use the 2001 TAF for planning purposes in support of the OMP EIS. At that time the 2001 TAF was the most current TAF published. Additionally, FAA recognized that consideration would have to be given to subsequent forecasts. Subsequent to the December 19, 2002 letter, the 2002 TAF was released. The FAA and the City of Chicago Department of Aviation (City) established that the 2002 TAF more accurately reflects the current industry trend in aircraft fleet mix. It is anticipated that subsequent forecasts will be issued during the OMP EIS. Should there be significant changes in the forecasts or fleet mix beyond the 2002 TAF, the FAA would expect the EIS to include a sensitivity analysis of the differing forecasts.

The FAA also hereby reaffirms that the methodology used by the City, noted in the December 19, 2002 letter, in preparation of derivative demand profiles through 2022 is appropriate and sound.

We appreciate your ongoing commitment to coordination efforts with us on this EIS.

Sincerely,

Philip M. Smithmeyer, Manager
Chicago Airports District Office

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